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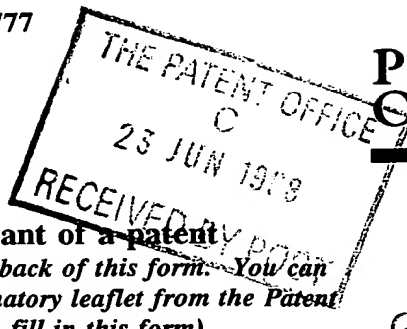

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2. Patent application number *(The Patent Office will fill in this part)* — 23 JUN 1998 — **9813390.3**

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

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GROENEWOUDSEWEG 1
5621 BA EINDHOVEN
THE NETHERLANDS

Patents ADP Number (*if you know it*)
06828487001 ~~7001~~ 7419294001

If the applicant is a corporate body, give the country/state of its incorporation — THE NETHERLANDS

4. Title of the invention — TELECOMMUNICATION SYSTEM WITH CHANNEL SHARING

5. Name of your agent (*if you have one*)

NICK J ERTL

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

Philips Electronics
Patents & Trade Marks Department
Cross Oak Lane
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Surrey RH1 5HA

Patents ADP number (*if you know it*)

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Country	Priority Application number (*if you know it*)	Date of filing (*day/month/year*)

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DESCRIPTION

TELECOMMUNICATION SYSTEM WITH CHANNEL SHARING

This invention relates to telecommunication systems with communication channels established between first and second stations, for example between a base station and mobile stations of a cellular telephone network. The invention is particularly concerned with the reduction in system efficiency which results when a channel is allocated to a discontinuous data source.

Some current cellular radio systems, such as GSM, make use of the discontinuous nature of speech data by only transmitting coded speech data when the speaker is actually talking. In a conventional TDMA system, such as GSM, this has the effect of reducing interference levels for other users and also saves power. However, even though transmission is avoided during null periods of the discontinuous speech data, the channel established for transmission of the speech data remains allocated to that data until the end of the call. As a result, the capacity of the system is not optimised, resulting in a reduction in system efficiency.

It is also known to provide dual mode channels for the transmission and reception of speech data as well as packet data over the same channel. One such system is described in International Patent Application WO97/22216, which is particularly suitable for providing cellular digital packet data (CDPD) services. In that system, the dual mode channel is allocated either to voice communications or to packet data communications, with voice communications having a higher priority. However, the discontinuous nature of the voice communication still results in inefficient use of the system capacity, because a continuous channel is still allocated to the discontinuous speech data.

According to the present invention, there is provided a telecommunication system capable of transmitting real-time discontinuous data and non-real-time packet data, comprising a first and a second communication

station, and having a dual mode channel for communication of both the real-time and the non-real-time data from the first to the second station, wherein the first station comprises a first transceiver which is operable to transmit both the real-time and the non-real-time data, and the second station comprises a second transceiver which is operable to receive the real-time and/or the non-real-time data, the first station further comprises a controller for controlling the allocation by the first transceiver of data to the dual mode channel, such that the non-real-time packet data is transmitted over the dual mode channel during pauses in the discontinuous real-time data.

In the system of the invention, non-real-time packet data is allocated to the pauses in the discontinuous real-time data. This enables the maximum system capacity to be utilised. The real-time discontinuous data may comprise speech data, and the non-real-time packet data may comprise computer files or facsimile data, for example.

The first station preferably comprises a speech coding system which prepares the speech data for transmission from a speech input, and the controller receives timing information from the speech coding system indicating the timing of interruptions in the speech data stream. In this way, the speech coding system is able to provide the timing information required to enable the system to be implemented. Minimum additional hardware is thereby required in order to implement the invention.

The first transceiver preferably comprises a buffer for storing the non-real-time packet data for transmission in the pauses. This enables a queue of data to be prepared for transmission as soon as pauses in the discontinuous data stream occur.

The first station may comprise a base station, and the second station may comprise a mobile station of a cellular telecommunications network.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a transmitter for use in the system of the invention; and

Figure 2 shows a receiver for use in the system of the invention.

The invention provides a telecommunication system enabling transmission from a first station to a second station within the system, and which provides an efficient use of channel resources to enable the transmission of real-time data and packet data using a single channel. For this purpose, the transmitting station is able to modulate onto the single channel carrier both the real-time data and the packet data. The packet data is transmitted during pauses in the discontinuous real-time data stream. The real-time data, due to its real-time delay constraints, takes priority over the packet data. One preferred use of the invention is the transmission of real-time discontinuous speech data with packet data (such as a facsimile message, Internet files or other computer files) interspersed within the speech data. The invention is, however, also applicable to other types of real-time data, such as video transmissions.

Figure 1 shows, in schematic form, a transmitter which can be used in the system of the invention. The transmitter 10 has a real-time data input 12 which, for the purposes of this example, will be described as a speech input, and a non-real-time packet data input 14.

The data from the speech input 12 passes to a speech coder 16 which converts the analogue speech signal into sampled digital speech data. The speech coder 16 is able to detect when there is a pause in the discontinuous analogue speech input, which results in empty digital samples. The timing of these empty samples is fed from the speech coder to an overall system controller 18. Data from the packet data input 14 is supplied to a buffer 20 which stores existing packet data for transmission in available time slots. The data from the buffer 20 and from the speech coder 16 is supplied to a coder 22 which formats the two inputs into an appropriate form for subsequent transmission. In particular, the coder combines the real-time data and the

packet data, and produces discrete data packets for transmission over subsequent allocated time segments (if a TDMA system is being used). Preferably, the data in each time slot of a TDMA system will contain exclusively packet data or speech data, although it could be envisaged that a part of an individual time slot may be allocated to real-time data and an unused part may be allocated to packet data. This system may be appropriate if the real-time data has a variable data rate.

The data from the coder passes to a transmission control unit 24 which allocates an appropriate header to each sample of data for transmission during an allocated time slot. The header may include an indication of whether the particular data sample is allocated to the real-time (speech) data or to the packet data. If required, the header may indicate which part of each individual time segment has been allocated to the speech data and which part has been allocated to the packet data. This information may, alternatively, be provided over a separate control channel controlled by the transmission control unit 24.

The transmission control unit 24 may also perform inter-leaving of a number of the data samples, in order to increase diversity in the transmitted channel.

The transmission control unit 24 also includes a frame generator, so that the output of the unit 24 can be supplied to a modulator 26, for modulation by the appropriate selection modulation technique, and for transmission by a transmitter 28.

The system controller 18 governs the operation of the entire system, and it will be appreciated that timing aspects are critical, although no timing control details are described in this Application.

The system may comprise a cellular telephone system, with a number of base stations, each communicating with a large number of mobile stations within the cell of the base station at that particular time. In the case of a TDMA system, the invention enables a particular time slot to be allocated to more than one data channel. In the case of an up-link channel, this enables different types of data provided by a mobile station, in the case that a number of

applications co-exist in the mobile terminal, to be transmitted to the base station over a single allocated channel. In the case of the down-link signal, different types of data from the base station may be transmitted to a mobile over the single channel or, alternatively, different types of data may be directed to different mobile terminals within the cell.

In a TDMA system, more than one slot in a transmission time frame may be allocated to a particular communication channel. The allocation of real-time and packet data between multiple time segments within a time frame may be variable in a system operating according to the invention.

The invention may also be applied to other types of system, such as CDMA systems. In this case, if a significant part of the system transmission capacity is allocated to variable rate real-time data, the remaining system capacity can be used for non-real-time applications. The same spreading code will be required for the different types of data, and this may require the same spreading codes to be used for more than one user. The concept underlying the invention may be extended to allow more than two applications to share the same transmission channel, for example a video connection, a voice connection and a packet data transmission.

Figure 2 shows a receiver which can be used in a system of the invention. The components of the receiver effectively carry out the inverse functions of the components of the transmitter in Figure 1. Thus, a receiver 30 is provided which transfers the received signal to a demodulator 32 which supplies the demodulator signal to a transmission identification unit 34. The unit 34 may perform the function of de-interleaving, and reading the frame header, for example to determine which frames contain packet data and which frames contain speech data. This information is provided to the decoder 36 which reconstitutes the digital speech data and the digital packet data. The packet data is supplied to a buffer 38 and the speech data is provided to a speech decoder 40. A speech output 42 and a packet data output 44 are also provided.

Of course, in a practical system, each station will comprise a transceiver combining the features of the transmitter and the receiver described above.

A detailed description of the design and operation of a telecommunication system which can employ the invention has not been given, since the invention as described may be applied by those skilled in the art to existing telecommunication systems. Existing considerations relating to timing aspects, encryption aspects and detailed system architecture apply to a system to be operated according to this invention, and these considerations will be apparent to those skilled in the art.

CLAIMS

1. A telecommunications system capable of transmitting real-time discontinuous data and non-real-time packet data, comprising a first and a second communication station, and having a dual mode channel for communication of both the real-time and the non-real-time data from the first to the second station, wherein

the first station comprises a first transceiver which is operable to transmit both the real-time and the non-real-time data,

the second station comprises a second transceiver which is operable to receive the real-time and/or the non-real-time data, and

the first station further comprises a controller for controlling the allocation by the first transceiver of data to the dual mode channel, such that the non-real-time packet data is transmitted over the dual mode channel during pauses in the discontinuous real-time data stream.

2. A system as claimed in claim 1, wherein the real-time discontinuous data comprises speech data.

3. A system as claimed in claim 2, wherein the first station comprises a speech coding system which prepares the speech data for transmission from a speech input, and wherein the controller receives timing information from the speech coding system indicating the timing of interruptions in the speech data stream.

4. A system as claimed in any preceding claim, wherein the first transceiver comprises a buffer for storing the non-real-time packet data for transmission in the pauses.

5. A system as claimed in claim 1, wherein the first station comprises

a base station, and the second station comprises a mobile station of a cellular telecommunications network.

ABSTRACT

TELECOMMUNICATION SYSTEM WITH CHANNEL SHARING

A telecommunication system uses at least one dual-mode channel capable of supporting real time discontinuous data (e.g. speech) and non-real time packet data. The packet data is queued in a buffer and inserted into the pauses in the real-time data stream.

Figure 1

FIG 1

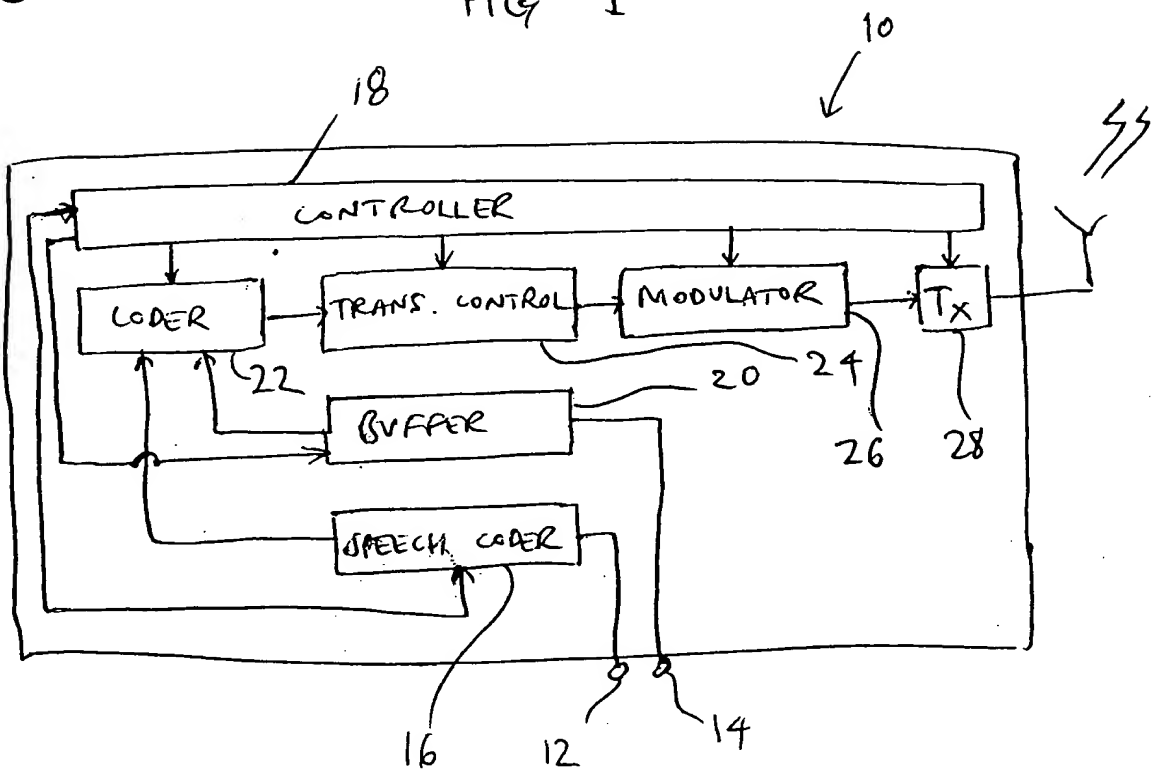
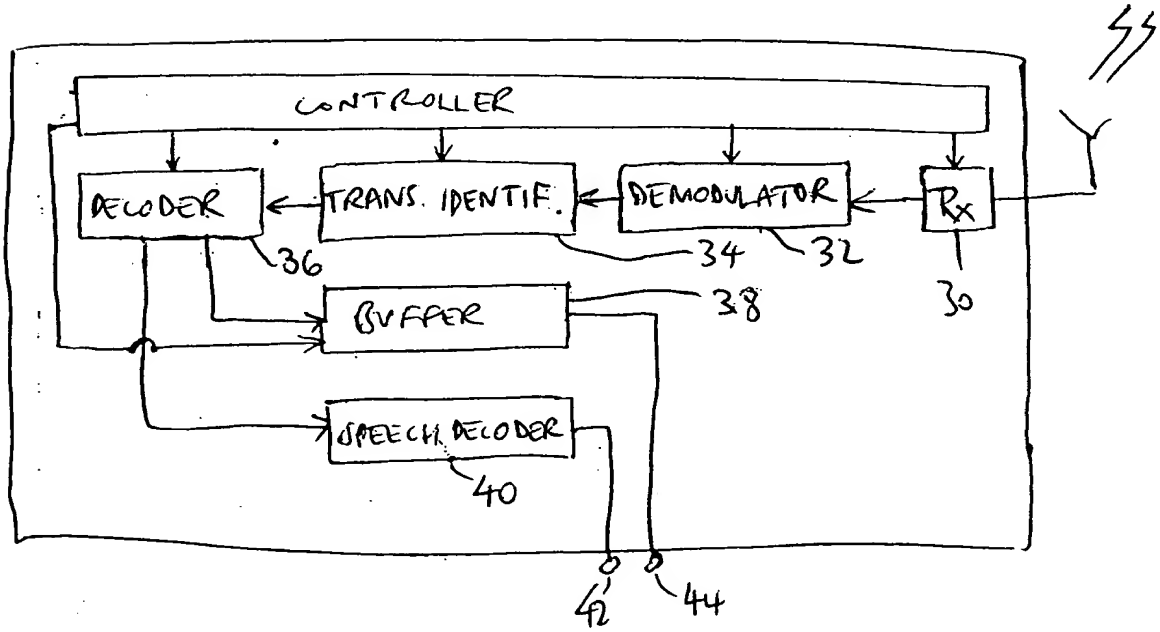

10
18
CONTROLLER
CODER
TRANS. CONTROL
MODULATOR
Tx
22
20
24
BUFFER
26
28
SPEECH CODER
16
12
14

FIG 2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